

DATA AND INFORMATION

- ▶ DATA – Raw facts and figures which have some existence in real world.
- ▶ For eg: Name of person, Class, Branch, Roll No.
- ▶ INFORMATION – When data is processed, organized, structured or presented in a given context. Data in more useful form is called information.
- ▶ For eg: 30 students scored more than 85% in class.

DATA AND INFORMATION

Data is used to provide some information and **Information** is used for prediction and future analysis.

DATA ----- > INFORMATION
PROCESS

DATA ----- > Student's Marks

PROCESS ----- > TOTAL MARKS / NO. OF STUDENTS

INFORMATION ----- > Average Marks of the Class

IF Average ≥ 90 "ExCELLENT PERFORMANCE"
 ≥ 80 and < 90 "GOOD PERFORMANCE"
 ≥ 70 and < 80 "CAN DO BETTER "
REST " NEED TO WORK HARD"

ID	NAME	CLASS	MARK	GENDER
1	John Deo	Four	75	female
2	Max Ruin	Three	85	male
3	Arnold	Three	55	male
4	Krish Star	Four	60	female
5	John Mike	Four	60	female
6	Alex John	Four	55	male
7	My John Rob	Five	78	male
8	Asruid	Five	85	male
9	Tes Qry	Six	78	male
10	Big John	Four	55	female

DATABASE

Database - It is a collection of related data and storage area where we store it for retrieving information. A database has the following properties:

- ▶ It is a representation of some aspect of the real world or a collection of *data elements* (facts) representing real-world information.
- ▶ A database is logical, coherent and internally consistent.
- ▶ A database is designed, built and populated with data for a specific purpose.
- ▶ Each data item is stored in a field.
- ▶ A combination of fields makes up a *table*. For example, each field in an employee table contains data about an individual employee.

DATABASE MANAGEMENT SYSTEM

- ▶ **DATABASE** A database can be viewed as a repository of data that is defined once and then accessed by various users

For eg: EMPLOYEE database will have interrelated data like EMP_ID, EMP_NAME, EMP_ADDRESS, EMP_PHONE, GENDER, DESIGNATION etc.

- ▶ **DATABASE SYSTEM** – It provides a convenient way to store, retrieve and manipulate data.
- ▶ **DATABASE MANAGEMENT SYSTEM** – An application software which provide convenient way to access database system.

For eg: MYSQL, ORACLE, DB2,

DATABASE MANAGEMENT SYSTEM

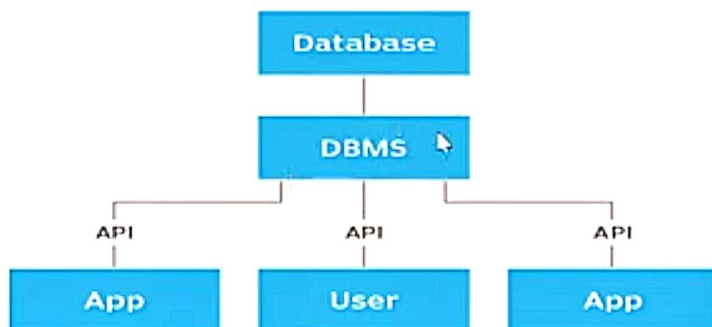
- ▶ A Database Management System(DBMS) is a collection of interrelated data and a set of programs to access those data.

DBMS = DATA + Set of Programs

- ▶ DBMS is used to organize the data in the form of a table, graphs, trees depending upon the database being used.
- ▶ The primary goal of a DBMS is to provide a way to store and retrieve database information that is both convenient and efficient.
- ▶ A database is a collection of related information, so that it is available to many users for different purpose.
- ▶ A DBMS makes it possible for end users to create, protect, read, update and delete data in a database.

DATABASE MANAGEMENT SYSTEM

DBMS components

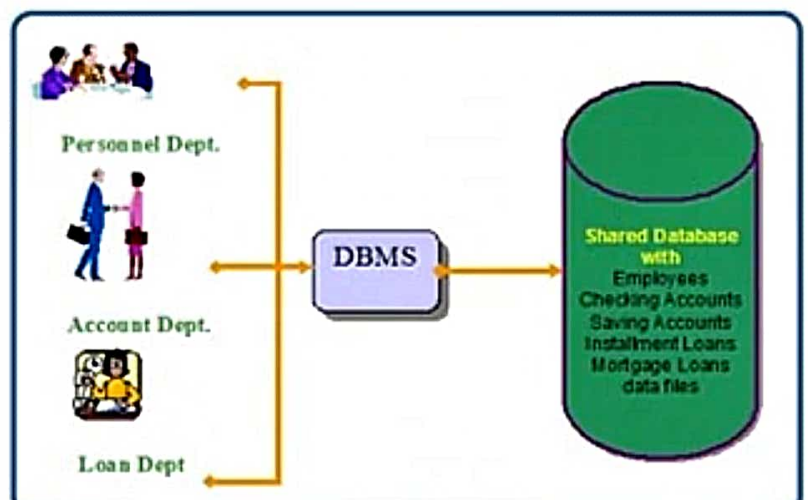


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The most prevalent type of data management platform, the DBMS essentially serves as an interface between databases and users or application programs, ensuring that data is consistently organized and remains easily accessible.

EXAMPLE OF DBMS

A DBMS is used by the Personnel Department, the Account Department and the Loan Department to access the shared corporate database.



CHARACTERISTICS OF DBMS

- ▶ A database management system is able to store any kind of data in a database.
- ▶ The Database management system allows so many users to access databases at the same time.
- ▶ Backup and recovery are the two main methods which allow users to protect the data from damage or loss.
- ▶ It also provides multiple views for different users in a single organization.
- ▶ It follows the concept of normalization which is helpful to minimize the redundancy of a relation.
- ▶ It also provides users query language, helpful to insert, retrieve, update, and delete the data in a database.

APPLICATIONS OF DBMS

- ▶ **Railway Reservation System** – The railway reservation system database plays a very important role by keeping record of ticket booking, train's departure time and arrival status and also gives information regarding train late to people through the database.
- ▶ **Library Management System** – Now-a-days it's become easy in the Library to track each book and maintain it because of the database. This happens because there are thousands of books in the library. It is very difficult to keep a record of all books in a copy or register. Now DBMS used to maintain all the information related to book issue dates, name of the book, author and availability of the book.
- ▶ **Banking** – Banking is one of the main applications of databases. We all know there will be a thousand transactions through banks daily and we are doing this without going to the bank. This is all possible just because of DBMS that manages all the bank transactions.
- ▶ **Military** – In military areas the DBMS is playing a vital role. Military keeps records of soldiers and it has so many files that should be kept secure and safe. DBMS provides a high security to military information.

APPLICATIONS OF DBMS

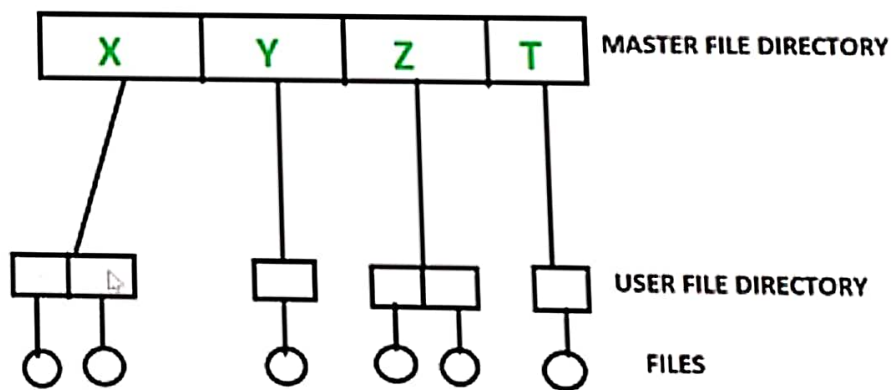
- ▶ **Universities and colleges** – Now-a-days examinations are done online. So, the universities and colleges are maintaining DBMS to store Student's registrations details, results, courses and grade all the information in the database.
- ▶ **Credit card transactions** – The purchase of items and transactions of credit cards are made possible only by DBMS. A credit card holder has to know the importance of their information that all are secured through DBMS.
- ▶ **Social Media Sites** – By filling the required details we are able to access social media platforms. Many users sign up daily on social websites such as Facebook, Pinterest and Instagram. All the information related to the users are stored and maintained with the help of DBMS.
- ▶ **Airline Reservation system** – Just like the railway reservation system, airlines also need DBMS to keep records of flights arrival, departure and delay status.
- ▶ **Human Resource Management** – The management keeps records of each employee's salary, tax and work through DBMS.

File System

The file system is basically a way of arranging the files in a storage medium like a hard disk. The file system organizes the files and helps in the retrieval of files when they are required. File systems consist of different files which are grouped into directories. The directories further contain other folders and files. The file system performs basic operations like management, file naming, giving access rules, etc.

Example: NTFS(New Technology File System), EXT(Extended File System).

File System

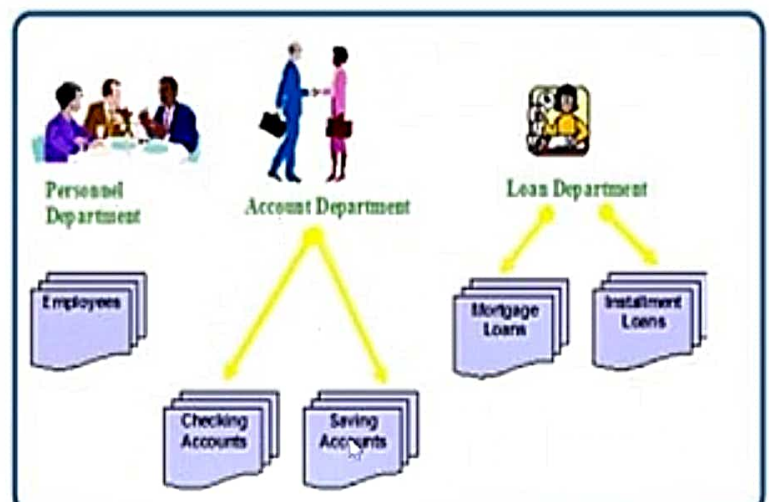


File System

One way to keep information on a computer is to store it in permanent files. A company system has a number of application programs; each of them is designed to manipulate data files. These application programs have been written at the request of the users in the organization. New applications are added to the system as the need arises. The system just described is called the *file-based system*.

File System

Consider a traditional banking system that uses the file-based system to manage the organization's data shown in Figure 1.1. As we can see, there are different departments in the bank. Each has its own applications that manage and manipulate different data files. For banking systems, the programs may be used to debit or credit an account, find the balance of an account, add a new mortgage loan and generate monthly statements.



Disadvantages of the file-based approach

► *Data redundancy*

Often, within an organization, files and applications are created by different programmers from various departments over long periods of time. This can lead to *data redundancy*, a situation that occurs in a database when a field needs to be updated in more than one table. This practice can lead to several problems such as:

- Inconsistency in data format
- The same information being kept in several different places (files)
- *Data inconsistency*, a situation where various copies of the same data are conflicting, wastes storage space and duplicates effort

Disadvantages of the file-based approach

► *Data isolation*

- *Data isolation* is a property that determines when and how changes made by one operation become visible to other concurrent users and systems. This issue occurs in a concurrency situation. This is a problem because:
- It is difficult for new applications to retrieve the appropriate data, which might be stored in various files.

► *Integrity problems*

- Problems with *data integrity* is another disadvantage of using a file-based system. It refers to the maintenance and assurance that the data in a database are correct and consistent. Factors to consider when addressing this issue are:
- Data values must satisfy certain consistency constraints that are specified in the application programs.
- It is difficult to make changes to the application programs in order to enforce new constraints.

Disadvantages of the file-based approach

► *Security problems*

Security can be a problem with a file-based approach because:

- There are constraints regarding accessing privileges.
- Application requirements are added to the system in an ad-hoc manner so it is difficult to enforce constraints.

► *Concurrency access*

- *Concurrency* is the ability of the database to allow multiple users access to the same record without adversely affecting transaction processing. A file-based system must manage, or prevent, concurrency by the application programs. Typically, in a file-based system, when an application opens a file, that file is locked. This means that no one else has access to the file at the same time.
 - In database systems, concurrency is managed thus allowing multiple users access to the same record.
- ◀ ▶ This is an important difference between database and file-based systems.

ADVANTAGES OF DBMS

1. Data Redundancy

Unlike traditional file-system storage, Data Redundancy in DBMS is very less or not present. Data Redundancy occurs when the same data are stored unnecessarily at different places. Data Redundancy is reduced or eliminated in DBMS because all data are stored at a centralized location rather than being created by individual users and for each application.

For e.g: Application A and Application B have the same user MARVEL, and we need to store personal information about the user such as Name, age, address, Date of Birth etc. Not to mention, this user has also access to different application, so in traditional file-based system, there is a need to maintain separate file system for each of the application to store user's information while in DBMS approach, there could be just one centralized location where information can be down streamed to the different application as and when needed.

ADVANTAGES OF DBMS

2. Data Inconsistency

In traditional file system storage, the changes made by one user in one application doesn't update the changes in other application, given both have the same set of details. While this is not the case with DBMS systems as there is a single repository of data that is defined once and is accessed by many users, and data are consistent.

3. Data Sharing

Data Sharing is the primary advantage of Database management systems. DBMS system allows users and applications to share Data with multiple applications and users. Data are stored in one or more servers in the network and that there is some software locking mechanism that prevents the same set of data from being changed by two people at the same time. While the file system doesn't have this capability.

ADVANTAGES OF DBMS

4. Data Searching

Searching and retrieving of data is very easy in DBMS systems. The need to write separate programs for each of the search is eliminated as in the case with a traditional file-based approach. In DBMS, we can write small queries to search for multiple information at a time from the data from DB servers.

5. Data Security

DBMS systems provide a strong framework to protect data privacy and security. DBMS ensures that only authorized users have access to data and there is a mechanism to define access privileges.

ADVANTAGES OF DBMS

6. Data Concurrency

In DBMS, Data are stored in one or more servers in the network and that there is some software locking mechanism that prevents the same set of data from being changed by two people at the same time.

7. Data Integration

Data integration is a process of combining the data residing at different locations and present the user with a unified view of data. DBMS systems allow Data Integration with much feasibility.

ADVANTAGES OF DBMS

8. Data Access

While in traditional file-based approach, it might take hours to look for very specific information that might be needed in the context of some business emergency, while DBMS reduces this time to a few seconds. This is a great advantage of DBMS because we can write small queries which will search the Database for you and it will retrieve the information in the fastest way possible due to its inbuilt searching operations.

9. Data Backup and Recovery

This is another advantage of DBMS as it provides a strong framework for Data backup, users are not required to back up their data periodically and manually, it is automatically taken care by DBMS. Moreover, in case of a server crash, DBMS restores the Database to its previous condition.

ADVANTAGES OF DBMS

10. Data Atomicity

An atomic transaction is one in which all of the database actions occur or none of them do. It is the duty of DBMS to store a complete transaction in the database. If any transaction is partially completed, then it rolls backs them.

For e.g: If we make an online purchase, money is deducted from our account while if the purchase is somehow failed, then no money is deducted or if it gets deducted, it gets returned within few days.

Before: X : 500	Y: 200
Transaction T	
T1	T2
Read (X)	Read (Y)
X: = X - 100	Y: = Y + 100
Write (X)	Write (Y)
After: X : 400	Y : 300